

WE CLAIM:

- 5 1. A friction material comprising a base material impregnated with at least one curable resin, the base material comprising i) a porous primary layer comprising a fibrous base material, and ii) a secondary layer comprising geometrically symmetrically shaped friction modifying particles at least partially covering an outer surface of the material; the material primary layer holding the geometrically symmetrically shaped friction modifying particles on the surface of the primary material layer.
- 10 2. The friction material of claim 1, wherein the primary layer material comprises fabric materials, woven and/or nonwoven materials.
- 15 3. The friction material of claim 2, wherein the primary layer material has a surface smoothness in the range of 0.02 mm Ra to about 0.2 mm which smooth surface provides the friction material with consistent anti-shudder and coefficient of friction characteristics.
- 20 4. The friction material of claim 1, wherein the friction modifying particles comprise symmetrically shaped silica particles.
5. The friction material of claim 1, wherein the friction modifying particles comprise symmetrically shaped celite particles.
- 25 6. The friction material of claim 1, wherein the friction modifying particles comprise a mixture of carbon particles and symmetrically shaped silica particles, the friction modifying particles being present at about 0.2 to about 80%, by weight, based on the weight of the primary layer material.
- 30 7. The friction material of claim 1, wherein the friction modifying particles cover about 3% to about 90% of the surface area of the primary layer material.

8. The friction material of claim 1, wherein the friction modifying particles substantially cover the surface area of the primary layer material.

5 9. The friction material of claim 1, wherein the friction modifying particles comprise a mixture of symmetrically shaped diatomaceous earth particles and fully carbonized carbon particles or partially carbonized particles, and mixtures thereof.

10 10. The friction material of claim 1, wherein the friction modifying particles comprises about 0.2% to about 50%, by weight, of friction modifying particles, based on the weight of the primary layer material.

15 11. The friction material of claim 6, wherein the friction modifying particles comprises about 20% to about 35%, by weight, of symmetrically shaped silica particles, and about 65% to about 80% carbon particles, based on the total weight of the friction modifying particles.

20 12. The friction material of claim 1, wherein the friction modifying particle size ranges from about 0.5 to about 20 microns.

13. The friction material of claim 1, wherein the friction modifying particles comprises symmetrically shaped diatomaceous earth.

25 14. The friction material of claim 1, impregnated with a phenolic resin or a modified phenolic resin.

15. The friction material of claim 14, wherein the friction material comprises about 40 to about 120% resin, by weight.

16. The friction material of claim 1, impregnated with a mixture of a phenolic resin and a silicone resin wherein the amount of silicone resin in the mixture ranges from approximately 5 to approximately 80%, by weight, based on the weight of the mixture, and optionally, wherein the phenolic resin is present in a solvent material and the silicone resin is present in a solvent material which is compatible with the solvent material of the phenolic resin.

17. The friction material of claim 14, wherein the modified phenolic resin comprises an epoxy phenolic resin.

18. A process for producing a friction material comprising:
forming a primary layer material,
coating about 3% to about 100% of at least one surface of the primary layer material with at least symmetrically shaped friction modifying particles, the symmetrically shaped friction modifying particles being present at about 0.2 to about 62%, by weight, based on the weight of the primary layer material, and

impregnating the coated material with a phenolic resin, or phenolic-based resin mixture, and thereafter curing the impregnated material at a predetermined temperature for a predetermined period of time.

19. The process of claim 18, wherein the friction modifying particles comprise a mixture of carbon particles and symmetrically shaped silica particles.

20. A process for producing a friction material comprising:
pre-saturating a primary layer material with a resin,
drying and curing the resin; and
subsequently coating the saturated and cured primary layer material with a mixture of phenolic resin and symmetrically shaped particles.

21. The process of claim 20, wherein the friction modifying particles comprise a mixture of carbon particles and symmetrically shaped silica particles.

5 22. A process for producing a friction material comprising:
substantially fully coating at least one surface of a primary layer
material with a secondary layer of geometrically symmetrically shaped
friction modifying particles,
impregnating with at least one type of resin, and
10 curing at a predetermined temperature for a predetermined period of
time to form the friction material.

23. The process of claim 22, wherein the friction modifying
particles comprise a mixture of carbon particles and symmetrically shaped
15 silica particles.

24. A process for producing a friction material comprising:
at least partially coating at least one surface of a primary layer with a
secondary layer comprising of a mixture of geometrically symmetrically
20 shaped friction modifying and irregularly shaped friction modifying particles,
impregnating with at least one type of resin, and
curing at a predetermined temperature for a predetermined period of
time to form the friction material.

25 25. The process of claim 24, wherein the friction modifying
particles comprise a mixture of carbon particles and symmetrically shaped
silica particles.

26. A process for producing a friction material comprising:

substantially fully coating at least one surface of primary layer with a secondary layer of a mixture of the geometrically symmetrically shaped friction modifying and irregularly shaped friction modifying particles, impregnating with at least one type of resin, and

5 curing at a predetermined temperature for a predetermined period of time to form the friction material.

27. The process of claim 26, wherein the friction modifying particles comprise a mixture of carbon particles and symmetrically shaped

10 silica particles.